



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

That these characteristics of the fauna mentioned are, in comparison with others, really successional, in the same manner as are different geologic epochs in relation to each other, can be proven by the study of the anatomy and development of the species of each. Their relative greater or less extension during the periods of geologic time also furnishes an indication of a chronic relation now existing between these faunæ. Thus we have before us some of the terms of that grand proposition, whose demonstration must ever be of high interest to mankind.



## THE CHASMS OF THE COLORADO.

BY A. HYATT.



IN Niagara we readily realize the power of demolition attributed to its waters. The Fall is still receding, the ground is shaken under us by its blows, the chasm it has cut yawns before our eyes. But it is another and far different matter to recognize the same force in other localities, where, perhaps, a puny stream, depleted by the summer heats, trails along the centre of some deep gorge.

Here the observer must remember that time has no boundaries in geology; that existing causes, provided they are capable of carrying away ever so small a portion of solid earth and rock now, would, in ages past, have had opportunity enough to have destroyed the whole of the rocky core which once filled the ravine.

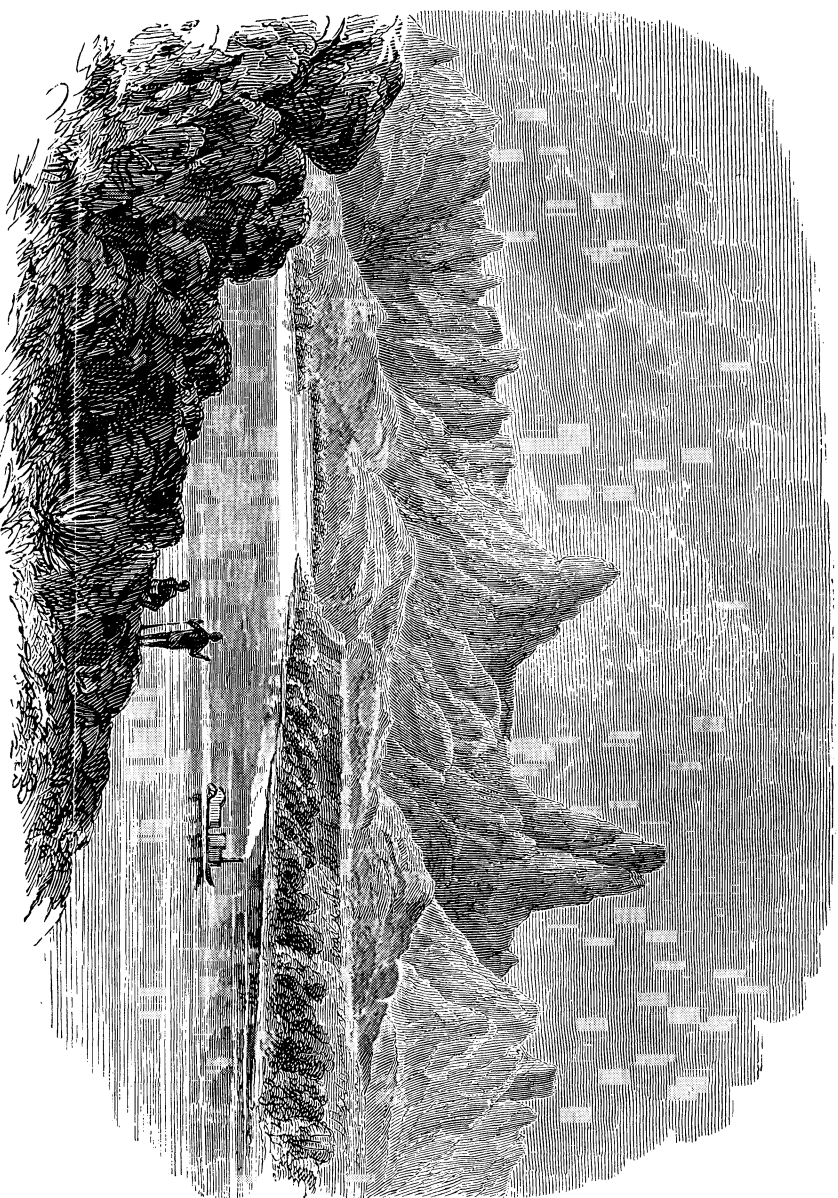
Let him descend and look at the tottering pinnacles threatening him from above, and then examine those that have already fallen. The layers of the shattered masses are open to the ice-wedges in winter, the grinding and transporting power of the spring freshets, the alternate heat of noon and cold of night. Acted upon also by the oxygen of the air,

the acids in the water now dry, now wet, is it a wonder that they are covered by a coat softer than the interior of the rock, which is readily ground off or dissolved by the stream? The rusty coating of iron arises from the same causes, and yields in the same way when exposed to similar influences, until the hard metal has entirely disappeared.

The lofty ledges themselves are constantly crumbling; the finer dust swept away by the winds; and the heavier pieces plunging to the bottom. Every rain carries away, in solution, the dust which the winds have spared, and a portion of the softened outer-coatings of the stones.

Watch the bottom of any fast-running rivulet, you will see a moving cloud of the finest particles, and under them larger pieces rolling confusedly onwards. The larger pieces are slowly but surely wearing themselves away, and the moving cloud is the result of this grinding. Thus it is that nearly all the stones found in brooks are pebbles. When first broken away from the parent rock they must have had sharp edges like any other fragment. Have you never found a piece of a bottle in the bed of a stream, with the edges nicely smoothed, and the sides scratched and scored like ground glass? They are quite common, and show how pebbles are made with perfect accuracy.

Quietly and almost imperceptibly the tireless waters work, except when heavy rains or spring freshets, muddy and discolored with their burden of dust and dissolved rock, move even large boulders and destroy well-known landmarks. The ability of water to handle rocks of any size, provided it is deep enough and swift enough, is unquestioned. In the Au Sable River, where the inclination of the shelving rock which formed the bed was not over two or three degrees, or the depth more than eighteen inches, I have myself, by the aid of a lever, rolled into the current great pieces of sandstone, three or four feet long and a foot thick, and heard their heavy rumbling over the ledge as they were carried away. Among the shales, limestones, and sandstones, ra-



CHIMNEY PEAK.

vines of this description are common ; and in these sedimentary rocks where layer answers to layer on either side of the gorge, there can be but little doubt that water has carved them out. In the more disturbed localities, however, where the stratification is obscured, it becomes difficult to determine whether the chasms were not originally great cracks in the earth, subsequently enlarged by the grinding and transporting power of the stream. The Colorado of the West affords the best illustrations of these two kinds which have yet been seen by man. In its lower part the rocky sides of the cañons are cut out of strata highly inclined and disturbed, where they have been bent upward to form the mountains, while in its upper portion they are perfectly horizontal.

Two rivers, the Green and the Grand, rise at the western bases of the Rocky Mountains, ten or twelve thousand feet above the sea, one in South-western Nebraska, the other in South-eastern Oregon, and are said to unite their streams near the southern boundary of Utah, to form the Colorado of the West. This then flows south-westerly, and empties into the Gulf of California. The descent is accomplished at first by a grand cañon cut through a succession of elevated plateaux, called Mesas, which spread out westward from the base of the Rocky Mountains, like a gigantic stairway, each step a thousand feet or so in height and many miles in breadth, and in its lower part by a series of cañons through ranges of mountains.

Plate 7\* shows the north-western prolongation of the Purple Hills, which form the first three cañons in the river. The two pinnacles of "Chimney Peak," looming up in the background, are composed of trap. This being much harder than the material of the neighboring rocks has yielded less to the action of the elements, and shows how vast has been the denudation which has destroyed them. Professor Newberry estimates that in some cases the wearing away of the moun-

---

\*From the Editors of the American Journal of Arts and Sciences.

tain masses has been upon such a grand scale, that now they are only half their original size.

The Mojave cañon, the fourth or fifth through which one passes in ascending the river, is described by Lieutenant Ives as follows: "A low, purple gateway, and a splendid corridor with massive red walls, formed the entrance to the cañon. At the head of this avenue, frowning mountains, piled one above the other, seemed to block the way. A sharp turn at the base of the apparent barrier revealed a cavern-like approach to the profound chasm beyond. A scene of such imposing grandeur, as that which now presented itself, I have never before witnessed. On either side majestic cliffs; hundreds of feet in height, rise perpendicularly from the water. As the river wound through the narrow inclosure, every turn developed some sublime effect or startling novelty in the view. Brilliant tints of purple, green, brown, red, and white, illuminated the stupendous surfaces and relieved their sombre monotony. Far above, clear and distinct upon the narrow strip of sky, turrets, spires, jagged, statue-like peaks and grotesque pinnacles overlooked the deep abyss."

To this succeeds the Painted Cañon, whose exquisitely tinted walls, though less grand, seem to have excited the artistic taste of the explorers not less than the Mojave Cañon. Then occurs the Black Cañon, where, for twenty-five miles, the narrow river plunges through the sunless depths of the Black Mountains, the precipices on either side rising perpendicularly a thousand feet or more from the water. The little band, in their frail boat, were buried in this fearful gorge for two days, and one follows them through the difficulties and dangers of the pass with breathless interest.

The walls of these cañons, according to Dr. Newberry, the geologist of the expedition, are formed of great masses of granite, porphyry, trap, and other volcanic rocks, with layers of highly crystalline limestone and conglomerates, which are of equal heights, and correspond exactly on either

side of the river. The unavoidable inference from these facts is that the mountain ranges, of which there are several besides those I have mentioned, once crossed the bed of the river and dammed back its flow, filling the valleys between with extensive lakes. These were probably connected by a series of cascades and rapids, which must have been of unparalleled beauty and grandeur; but as Niagara is destroying itself, so have they destroyed themselves. The stupendous precipices, so graphically described by Lieutenant Ives, are the trophies of their unconquerable power, the remnants of those mountain barriers through which the cataracts ate their way and drained the great lakes of the interior.

These chasms, however, with their thousand feet or so of granite and solid porphyries, are but the outer gates preparing the mind for the awful sublimity of the Great Cañon. The local disturbances or oscillations which gave rise to the wild scenery of the lowlands, tossing their originally horizontal layers into lofty mountainous waves, have made no impression upon its walls. The level courses of sandstone, limestone, and shale, lie upon a bed of granite, of itself a thousand feet thick, without a bend or fault to mar their perfect parallelism. The entire thickness of the first great Mesa or plateau, west of the Rocky Mountains, is exposed in the cliffs, and the edges of the severed plain hang in the air over a mile above the river.

"The scenery," says Lieutenant Ives, speaking of a side cañon down which they passed some seventeen miles to the river, "much resembled that in the Black Cañon, excepting that the rapid descent, the increasing magnitude of the colossal piles that blocked the end of the vista, and the corresponding depth and gloom of the gaping chasms into which we were plunging, imparted an unearthly character to a way which might have resembled the portals of the infernal regions." No attempt is made to describe the Great Cañon itself. The explorers seem to have succumbed to the awe created in their own minds, and yielded the greatest homage

they could have paid to the unearthly nature of the scene—silence. For three hundred miles the precipitous walls vary from three thousand to six thousand feet in height, and on every side the plain is furrowed by the tributaries, so that “fissures, so profound the eye cannot penetrate their gloomy depths, are separated by walls whose thickness one can almost span, and slender spires that seem tottering upon their bases, shoot up thousands of feet from the vaults below.”

The country is impassable to man and beast, and none but birds can explore the cavernous abysses. The solitude is unbroken, and the inhospitable rocks deserted, save by a few Indians who drag out a wretched and monotonous existence among the subterranean passages. No vegetation clings to the sides of the cañon or covers the broken surface of the Mesa; all is alike naked and savage.\*

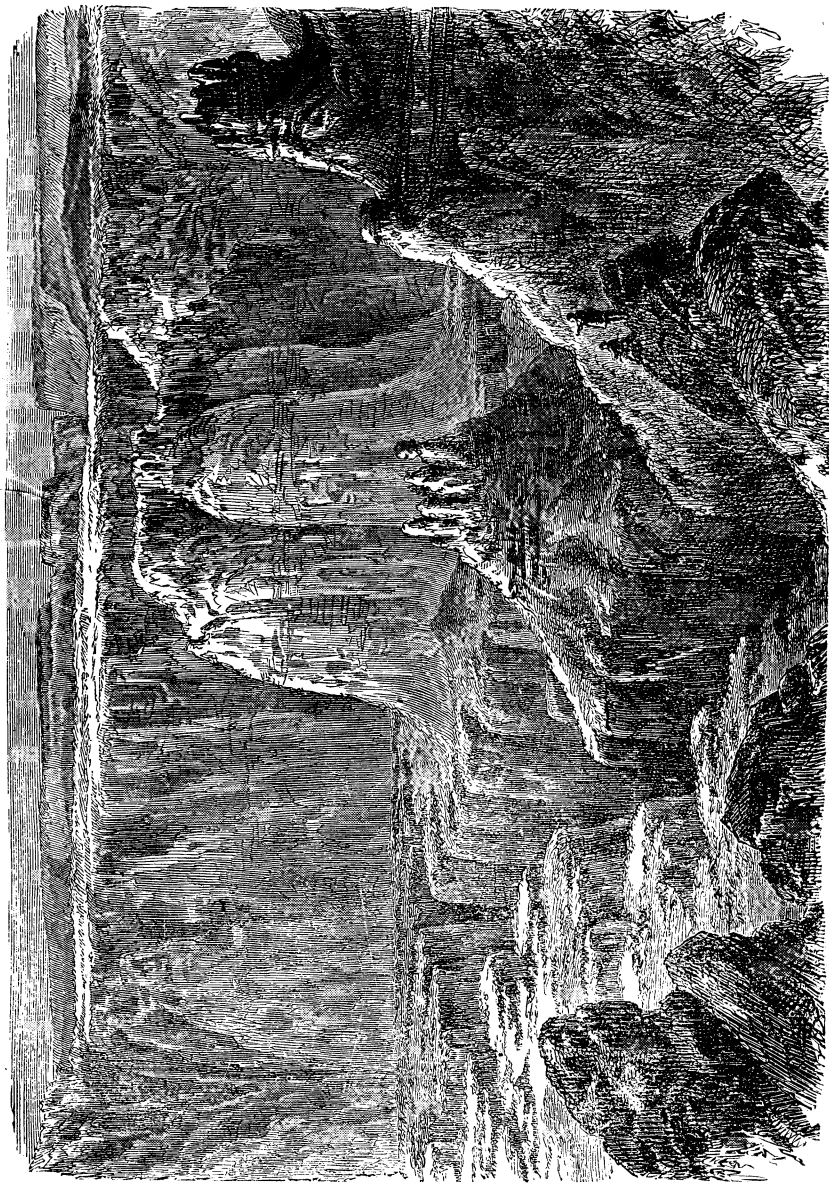
The chasm at Niagara excites much wonder, but what shall be said of this? The horizontal strata, answering layer to layer upon either side, are witnesses that cannot lie. If this three hundred miles of solid earth had been torn apart by volcanic forces, the strata would not now be horizontal, but contorted or bent upward. Had one part settled away from the other, leaving a gap between, the strata would not be at equal heights. The river is the only agent that could have done the mighty work. At some period of past time incalculably distant, the Colorado and its tributaries flowed over a mile above on the Mesa, and descended by a cascade into a great lake which filled the valley between the Great and the Black Cañons. A succession of such lakes, connected by cataracts or rapids as before described, led over the mountain chains, until step by step it reached the valley through which it now flows to the Gulf of California.

Newberry found, in the deposits of the lower part of the river, the tooth of a mastodon and the silicified remains of

---

\* Plate 8, for which we also are indebted to the kindness of the Editors of the American Journal of Arts and Sciences, gives a view of the general aspect of the surface, with other Mesas rising in the distance.





THE CHASM.

fossil drift-wood buried in the ancient banks now some two hundred feet above the present level. These remains indicate a far more abundant vegetation than at present, and that when the lakes spread their broad sheets over the now barren valleys, and the rivers were near the surface of the Mesa, all the land was covered by great forests of pine, among which huge elephants roamed and cropped the succulent leaves. Time has sapped this green, luxuriant youthfulness, and in its seared and wrinkled old age, though grander and more majestic, the country is bald and unfruitful.

---

## THE RUFFED GROUSE.

BY AUGUSTUS FOWLER.

---

THIS beautiful bird, the *Bonasa umbella*, is a resident in Massachusetts. It commences breeding very early in the season, so early indeed, that the nest and birds are frequently covered with the late snows.

It is at this time of the year, more than at any other, that the male practices the peculiar habit of drumming, to call his mate. He usually selects for the purpose the trunk of some fallen tree, and, mounting it, struts back and forth, with tail expanded and head thrown back and wings lowered till they drag upon the log. These are the preliminary movements. Suddenly he stops, throws his head forward, lowers his tail, compresses his feathers, and then commences to strike his sides with his wings, increasing the rapidity of the strokes, until the sound produced resembles low distant thunder.

They build their nest on the ground, in some secluded place, under a brush-heap, or by a log or fallen fence. It is composed of whatever suitable materials lie about the spot, such as dried grass, twigs, and dried leaves. After the